

BELLSOUTH

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Vice President-Federal Regulatory
September 2, 1998

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 m street, NW, Room 222
Washington, D.C. 20554

Re: CC Docket Nos. 96-45 and 97-160

Dear Ms. Salas:

Today, Jim Stegeman of INDETEC, Pete Sywenki of Sprint and the undersigned representing BellSouth met with Bill Sharkey and Mark Kennet of the Commission in connection with the above referenced dockets. The purpose of this meeting was to provide a review of the HCPM's clustering algorithms and to demonstrate the HCPM-BCPM User Interface. The attached material was discussed in this meeting. Also included is a computer disk which contains the HCPM-BCPM integration as requested by the Universal Service Branch of the Common Carrier Bureau's Accounting Policy Division.

Please call me if you have any questions.

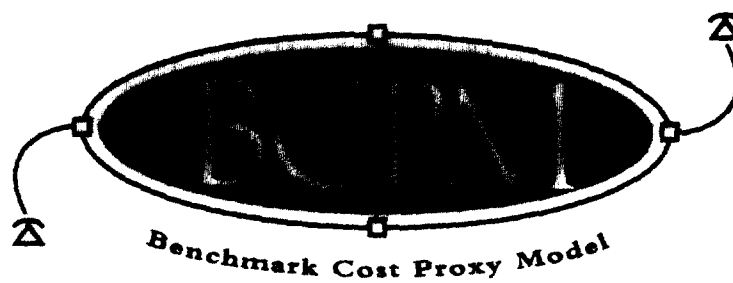
Yours truly,



W.W. Jordan
Vice President-Federal Regulatory

Attachments

cc: Chuck Keller
Mark Kennet
Jeff Prisbrey
Bill Sharkey



Version 3.1H
HCPM Integrated Edition

User Manual

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The Information may be used only in conjunction with the Benchmark
Cost Proxy Model. Use for any other purpose is strictly prohibited.

Table of Contents

ABOUT BCPM	1
ABOUT THIS MANUAL	1
CONVENTIONS	1
COMPUTER/SOFTWARE REQUIREMENTS	1
INSTALLATION.....	2
<i>Special Note</i>	2
GETTING STARTED	2
VIEWS.....	3
EDITING A VIEW	4
<i>Entering a Description</i>	4
<i>Selecting States</i>	4
<i>Modifying Modules</i>	4
<i>Selecting HCPM or BCPM View Type</i>	5
CREATING A VIEW	5
<i>Warning:</i>	6
DELETING A VIEW	6
INPUTS	6
MANUAL INPUTS	7
<i>BCPM Input Toolbar</i>	9
<i>Special Notes</i>	9
FILE INPUTS.....	9
<i>Changing File Inputs - FCC Lines</i>	10
<i>Special Note</i>	11
PROCESSING THE MODULES.....	11
<i>Special Note</i>	13
REPORTS	13
<i>Report Processing</i>	14
<i>Special Note</i>	15
REPORT OPTIONS.....	15
REPORT PARAMETERS	16
REVIEW	17
TECHNICAL SUPPORT	18
ATTACHMENT A: UTILIZING DOS ATTRIB COMMAND	19

Benchmark Cost Proxy Model

Version 3.1H

HCPM Integration Edition

User Manual

About BCPM

The Benchmark Cost Proxy Model or BCPM is a computer model designed to estimate benchmark costs for providing business and residential basic local telephone service nationwide. It is based in Microsoft Excel with a user interface developed in Visual Basic for Applications. This version has the HCPM Clustering and Feeder/Distribution modules integrated into the BCPM interface.

About this Manual

This manual is intended to help users of BCPM operate the model. It covers how to install the model, edit inputs, process and review calculations and generate reports.

It is assumed that the user is familiar with the basic operations associated with Windows '95.

For information regarding system flowcharts, model logic, and changes from earlier versions, see the document entitled *System Methodology*.

For information regarding BCPM's approach to modeling the telephone network, see the document entitled *Model Methodology*.

Conventions

In this manual you will see different references. Different typefaces will be used separate those items from each other.

Text to be typed will be italicized and bold.

BUTTONS ARE CAPITALIZED AND BOLD.

Computer/Software Requirements

In order to install and process BCPM, you must ensure that your computer meets the following minimum computer requirements:

- Windows '95
- Pentium Processor 200 MHz (400 MHz + Recommended)
- 200 Megabytes of free Hard Drive Space per state
- 32 MB RAM (128 MB Recommended)
- Microsoft Excel '97 with Data Access Objects loaded.

Installation

The model is on CD-ROM. To install the model

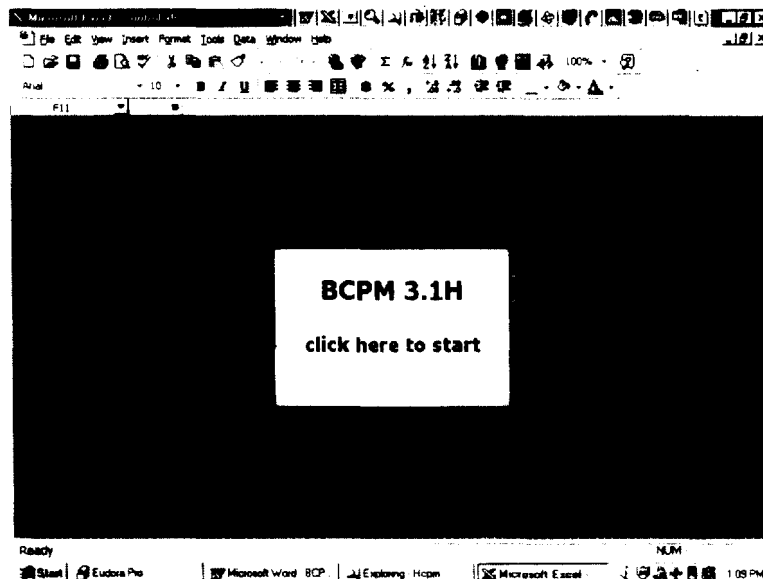
- Insert CD-ROM into CD-ROM drive.
- Using Explorer, drag BCPM31H folder onto destination drive (i.e. C:).
- Exit Explorer.

Special Note

By default, all files that are copied from a CD-ROM are flagged as read-only. To use the model, the files must be flagged as read-write. To change the file flags you need to invoke a DOS session on your PC and use the Attrib command. Specifically, you must type **Attrib -r /s** while in the folder associated with the model.

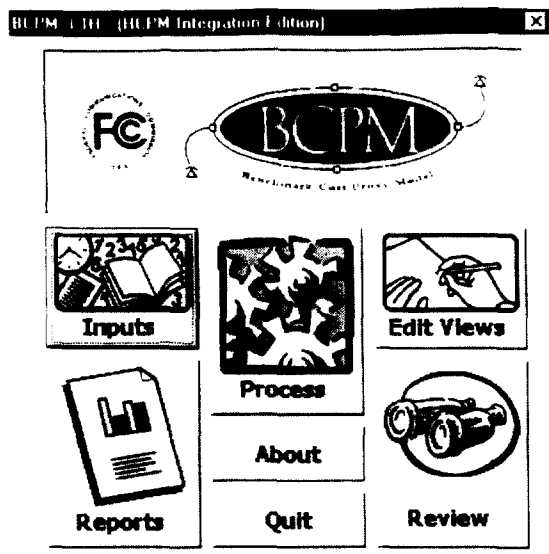
See Attachment A for more detailed instructions on using the Attrib command.

Getting Started



To start BCPM, you must open the Control.xls file. The Control.XLS file is stored in the BCPM31 folder you copied from the CD. This can be done using either Excel directly or using Explorer. When the file is opened your screen should look as follows:

By clicking on the **START** button, you will open the 'BCPM Control' screen.



The BCPM Control screen has six buttons: **INPUTS**, **PROCESS**, **EDIT VIEWS**, **REPORTS**, **ABOUT**, **QUIT** and **REVIEW**

The **INPUTS** button allows you to view and modify the data inputs.

The **PROCESS** button allows you to select which modules you would like to process.

The **EDIT VIEWS** button allows you to select the model parameters for processing.

The **REPORTS** button allows you to set report parameters and generate reports.

The **ABOUT** button will display release information and the phone number for customer support.

The **QUIT** button returns you to the BCPM **START** screen

The **REVIEW** button allows you to examine the calculations for the various modules provided with the model.

The typical processing run on BCPM would entail the following steps

- Edit/Create a view
- Edit/Review data inputs
- Process selected modules
- Run the Reports Processing
- Generate reports

Views

The View within BCPM is the glue that holds the model together. It is used to set the parameters for processing. These parameters include which data sets are used with a particular module, whether this view is an HCPM view and which states can potentially be processed. All result data sets are tied to a particular View.

Each View typically represents a different configuration of data and modules. To work with an existing View or generate a new View, select the **EDIT VIEWS** button on the BCPM Control screen. The BCPM - Edit View screen, shown below, will appear.

View	Name	Date Created
hcpm	hcpm	9/1/98

Description: HCPM test

View Type:
☐ BCPM Grds and Loop
☒ HCPM

Module	Module Set	Data Set
Loop	Transport.xls	
Transport	Switch.xls	
Switching	CAPCOST.XLS	
Capcost		

Selected States: Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia

Buttons: Delete, New, Close

To work with a View it is first necessary to make a selection from the View list. Once a selection is made, all information associated with the View is displayed. The Description is used as a short label for the View. The Selected States list contains the states that will potentially be processed and the Module list shows the association of modules to data sets. You can either work with an existing View or create a new View.

Editing a View

Once a View has been selected it is possible to change the parameters associated with that View.

Entering a Description

Type in the new text for the description in the Description text box.

Selecting States

The Available States list contains a list of states that are not currently selected for processing. You can move a individual state into the Selected States list by first selecting the state and then using the directional arrow buttons. The ">" button moves a single state at a time. To move all states, use the ">>" button. To remove one or all of the states from the Selected States list, use the opposing arrow(s) buttons. Any combination of states can be associated with a particular view.

Modifying Modules

It is possible to change both the module and data set for each of the module types (i.e. Loop, Transport, Switching, Signaling, and CapCost). To make a change, select the module type from the list. The values shown in the Module Set column and Data Set column of the list will be

displayed in the dropdown lists titled Module and Dataset respectively. If there are any alternate choices for either the module or data, they will be shown in the dropdown lists.

Special Note

Only the Loop module has a user defined data set. The other modules do not have any data sets associated with them, but it is still possible to change the workbook associated with a given module. At this time, the Signaling module is not operational. If you have selected the HCPM view type then the system will blank out the Loop Module set.

Selecting HCPM or BCPM View Type

The system uses this check box to determine whether to use HCPM clustering and loop logic or to use the BCPM grids and loop logic. This selection will also turn off (gray out) options that are not used for HCPM or for BCPM processing. If you click on HCPM you will not be able to use the CBG rollup option during processing. If you click on BCPM Grids and Loop you will not be able to use the clustering option during processing.

If you would like to edit data inputs, make sensitivity runs, or modify modules, it is recommended that you create a new View rather than modify an existing file.

The changes made on the screen are not saved until the **Update** button is clicked.

Creating A View

When you click the **NEW** button on the BCPM - Edit View screen, you are presented with the New View screen:

New View

Enter the new view name, and select the existing view to copy from:

New View Name: _____

Copy From: _____

View Type:

☐ BCPM Grids and Loop

☐ HCPM

Description: _____

OK

Cancel

Enter a name for the new View in the New View Name text box. Select an item in the "Copy From" dropdown box. The "Copy From" name is used to generate a copy of the manual inputs file and set the initial parameters associated with the new View. Then select the view type. The view type triggers the appropriate modules during the processing portion of the model. Lastly,

enter a short description of the purpose of the view. After you enter the information, click on the **OK** button and the system will create a new View.

Then, you can select it from the View window as described above and modify the module set, data set, or states available for processing, as necessary.

When you have completed your modifications, select **UPDATE** to save your changes under the new View file name.

Warning:

When selecting a View name, the name should not include the '_' (underscore) character or blank characters.

Deleting a View

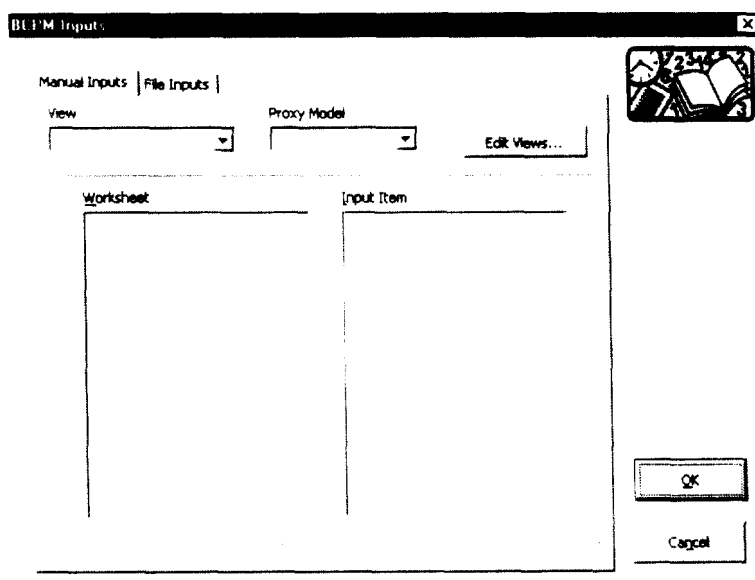
To delete an existing View, first select the View then click the **DELETE** button. Deleting a view not only removes the file associated with the view, but all result sets associated with the view. Deleting a view is not reversible.

Inputs

The inputs to the BCPM model can generally be grouped into two categories. Manual inputs are those associated with single entry values or at most small tables of information. File inputs are generally used to capture large amounts of like information. Examples of file inputs would be the FCC Lines data, LERG data, etc.

To review or edit the model inputs, select **INPUTS** on the BCPM Control screen. The BCPM Inputs screen is shown below.

The two tabs that are displayed correspond to the two input types.



Manual Inputs

By selecting the Manual Inputs tab you will be able to work with the manual inputs. In order to work with a specific set of inputs you need to select a View from the View dropdown list. If you select a view that is HCPM enabled then you can use the drop down box under "Proxy Model" and select either BCPM or HCPM and then the input tables will display for that particular model. If you are attempting to edit an HCPM view, you will still need to edit the BCPM data for the Switching, Transport, Signaling, Expense, and Capcost portions of the BCPM model.

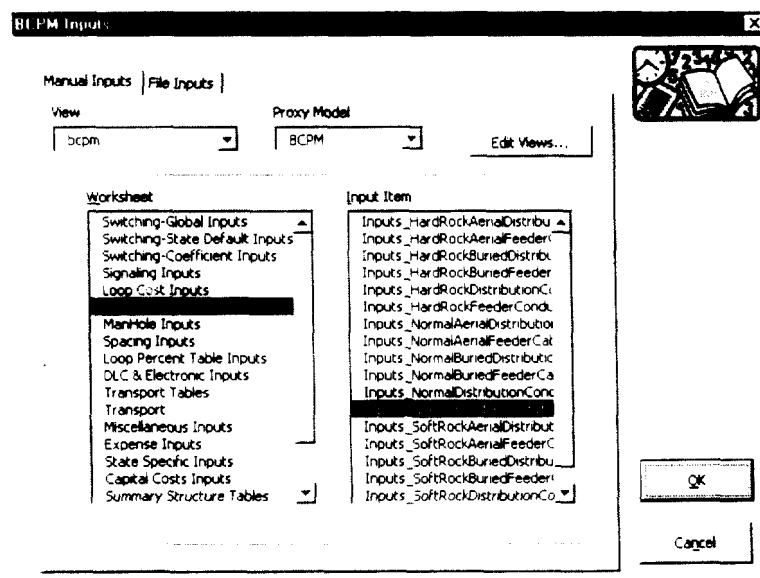
You can also create a view from this screen. Clicking on the **EDIT VIEWS** button will take you to the BCPM – Edit Views screen. Refer to the Views section above for the options available when editing a view.

If you are just interested in reviewing inputs, or have several inputs to change then if you select the **OK** button the Input workbook will be opened and the appropriate input data loaded.

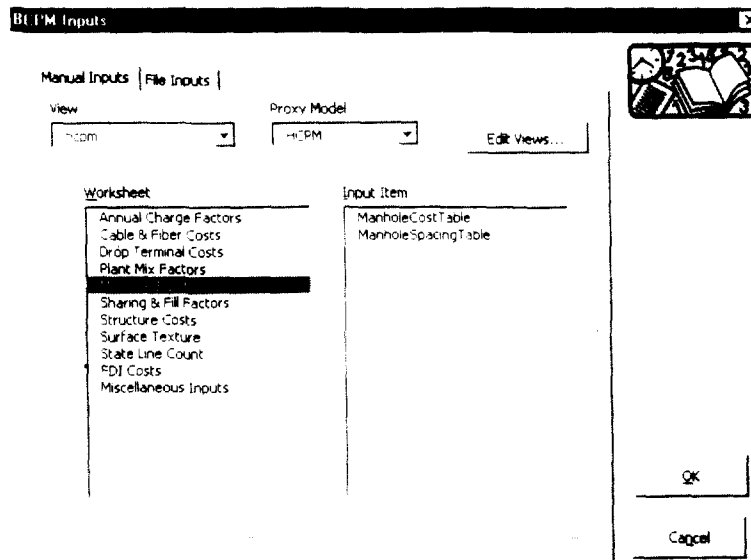
However, if you want, you can navigate to a specific data item or group of data items by using the Worksheet list and Input Item list. The Worksheet list corresponds to general groupings of data. For instance, the list item Structure Inputs contains all the inputs associated with plant structure. The list item also corresponds to the label on the worksheet tab in the Input workbook. These tabs can also be used to navigate to groups of inputs.

The Input Items list contains all the specific data items associated with a group of like inputs. The items in the Input Items list generally are associated with a named range. The input, again, could either be a single value or a table of like information. In the example shown below, the inputs used in the Normal Feeder Conduit on the Structure Inputs worksheet will be highlighted.

Below is the screen that would appear if you chose to navigate to the Normal Feeder Conduit inputs on the Structure Inputs worksheet.



If you want to edit inputs for an HCPM type view then the screen will present you with different inputs for the HCPM modules.



By selecting the **OK** button, the Input workbook will be opened and the appropriate input data loaded into the workbook. An example of the Input workbook is displayed below.

Microsoft Excel - Input.xls

File Edit View Insert Format Tools Data Window Help

Times New Roman 10 75%

Inputs_NormalFeed... Trench & Backfill

Normal - Distribution Cables									
Activity	Base Cost Per Foot Installed	Cost Adjustment	DENSITY 0.5			DENSITY 0.75			Cost
			% Activity	% Assigned Telephone	Weighted Amount	% Activity	% Assigned Telephone	Weighted Amount	
19 Trench & Backfill	\$ 2.22	\$	27.30%	30.30%	\$ 37	\$ 3.11	11.00%	35.00%	\$ 1.61
20 Rock & Pave	\$ 4.22	\$	2.00%	30.30%	\$	\$ 3.15	10.00%	35.00%	\$
21 Backhoe Trench	\$ 2.70	\$	4.00%	30.30%	\$ 14	\$ 3.17	10.00%	35.00%	\$ 3.52
22 Hand Dig Trench	\$ 4.99	\$	2.00%	30.30%	\$ 10	\$ 2.25	2.30%	35.00%	\$ 3.10
23 Boring	\$ 11.80	\$	2.00%	30.30%	\$ 24	\$ 3.27	2.00%	35.00%	\$ 2.23
24 Cut & Restore Asphalt	\$ 6.72	\$	1.30%	30.30%	\$ 109	\$ 3.19	2.00%	35.00%	\$ 3.17
25 Cut & Restore Concrete	\$ 9.63	\$	1.00%	30.30%	\$ 110	\$ 2.15	2.00%	35.00%	\$ 3.19
26 Cut & Restore Soil	\$ 3.75	\$	2.00%	30.30%	\$ 106	\$ 3.17	2.00%	35.00%	\$ 3.07
			100.00%	30.30%	\$ 270		100.00%	35.00%	\$ 2.85

Normal - Buried Feeder Cable									
Activity	Base Cost Per Foot Installed	Cost Adjustment	DENSITY 0.5			DENSITY 0.75			Cost
			% Activity	% Assigned Telephone	Weighted Amount	% Activity	% Assigned Telephone	Weighted Amount	
21 Pipe	\$ 1.14	\$	95.00%	30.30%	\$ 109	\$ 3.12	15.00%	30.00%	\$ 3.90
22 Rock & Pave	\$ 1.37	\$	2.00%	30.30%	\$	\$ 2.03	1.00%	100.00%	\$ 3.11
23 Trench & Backfill	\$ 2.27	\$	3.00%	30.30%	\$	\$ 2.11	10.00%	37.50%	\$ 3.23
24 Rock & Pave	\$ 4.22	\$	1.00%	100.00%	\$	\$ 3.15	2.00%	37.50%	\$ 3.11
25 Hand Dig Trench	\$ 2.70	\$	2.00%	30.30%	\$	\$ 2.11	4.00%	37.50%	\$ 3.11

Ready Structure Inputs Manhole Inputs Spacing Inputs Loop Percent Table Inputs DUC & Electronic Input NUM

Sum=213.401725

Those inputs that should be changed are indicated in blue. The cells in the workbook that contain formulas should not be changed. There is no guarantee that any formula that is changed will be carried forward into any subsequent calculations.

BCPM Input Toolbar

The BCPM Input toolbar, shown below, provides shortcuts to some of the more common activities associated with data entry. The dropdown list contains a list of all named data items in the workbook. Selecting an item from the list will move to that item in the workbook.



The controls on the toolbar allow you to **SAVE**, **PRINT**, **COPY**, **PASTE VALUES** and **CLOSE**.

The SAVE button, represented by the disk icon, is used to save the data in the workbook to file. It is not necessary to save the workbook using the File\Save or File\Save As... menu choices. If the data is not saved to file, it will be lost.

The CLOSE button is used to close the workbook and return to the BCPM Inputs screen.

Special Notes

- Once you have made your data input changes, click on the **SAVE** button on the BCPM bar. **IF YOU DO NOT USE THIS TOOLBAR TO SAVE YOUR CHANGES THEY WILL NOT BE PROPERLY SAVED IN THE PROGRAM FILES.** Do not use the Microsoft Excel toolbar to save your file.
- Only change the items highlighted in blue. The model calculates the numbers in black.
- Do not change the values in the summary tabs at the bottom of the worksheet. The summary tables are calculated by the model and are for viewing purposes only.

File Inputs

The File Inputs tab allows you to create state-specific data input files for line counts and switch investments by wire center. By creating these files, you can override the line counts and switching investments developed by BCPM. They will be used in model calculations regardless of the View that is selected.

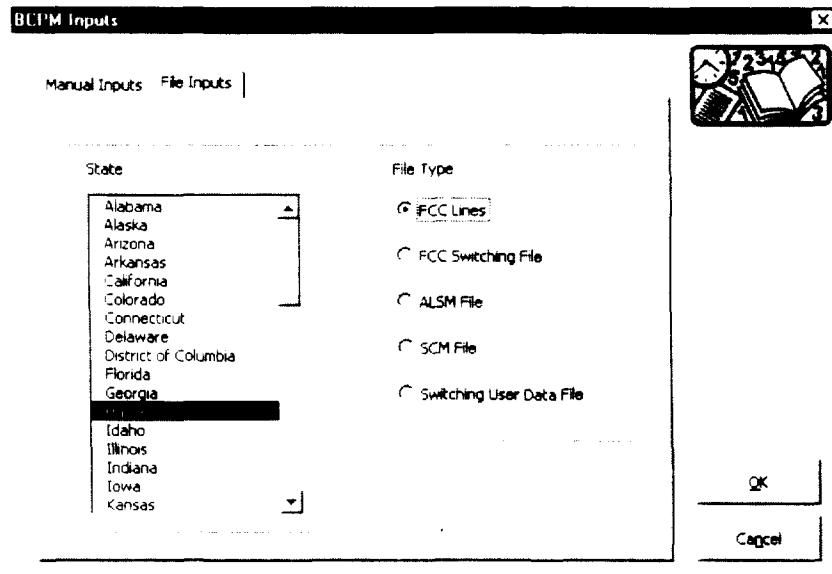
The data input files that you can populate are listed below:

FCC Lines	Includes line counts by wire center in a format matching FCC data requirements. BCPM will adjust grid line estimates at the wire center level to reflect the line counts entered.
FCC Switching File	Worksheet designed to incorporate FCC Switching investments by wire center
ALSM	Worksheet formatted to allow ALSM (Audited LEC Switching Model) switching investments to be entered by wire center.
SCM	Worksheet formatted to allow SCM (Switching Cost Model) switching investments to be entered by wire center.
Switching User Data	Worksheet designed to allow switching investments from models not listed to be incorporated.

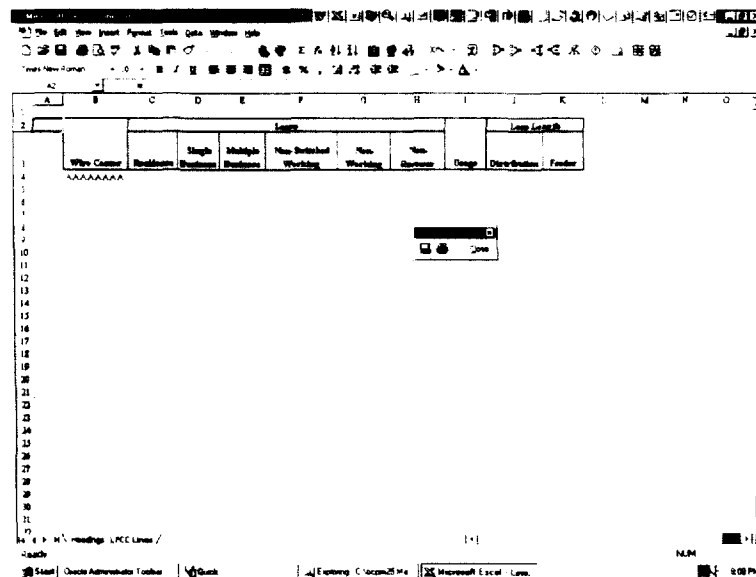
Changing File Inputs - FCC Lines

Below is the screen that is displayed when you click on the File Inputs tab:

To create or change a file, select a state and the type of file you wish to create. BCPM will open



the appropriate worksheet and you can enter the data inputs. The worksheet used for FCC Lines is shown below:



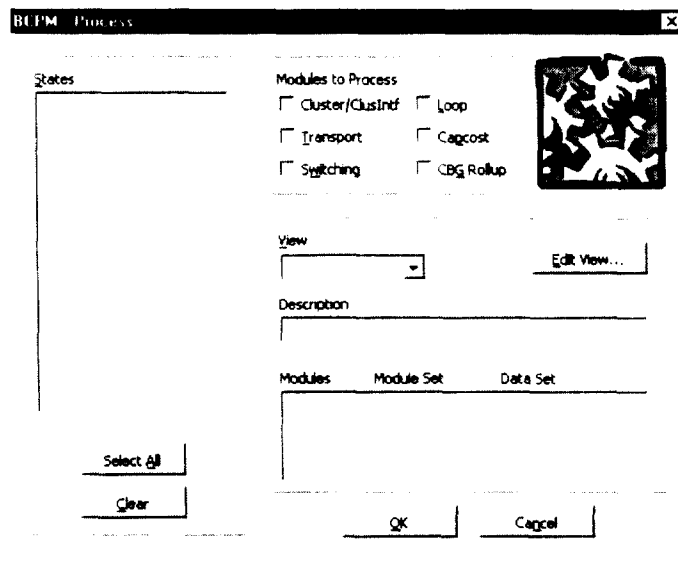
Enter the 8 digit code (not the 11 digit code) for the wire center and the actual lines counts for each column. Use the BCPM toolbar to save your entries.

Special Note

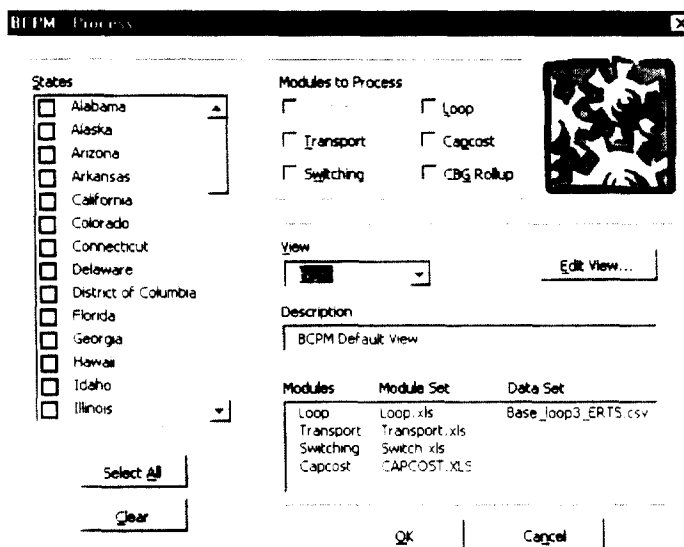
Regardless of the View selected, whenever the FCC Lines file is populated, line estimates will be adjusted at a wire center level to reflect the data entered

PROCESSING THE MODULES

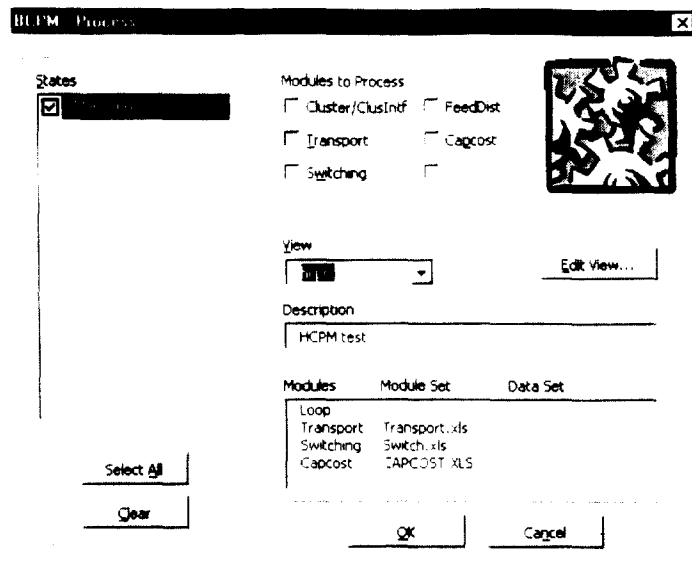
To process the modules in the model, click the **PROCESS** button on BCPM Control screen. The BCPM – Process screen will appear:



If you select a BCPM view you the system will gray out the Cluster/ClusInf module and rename FeedDist to Loop as pictured below.

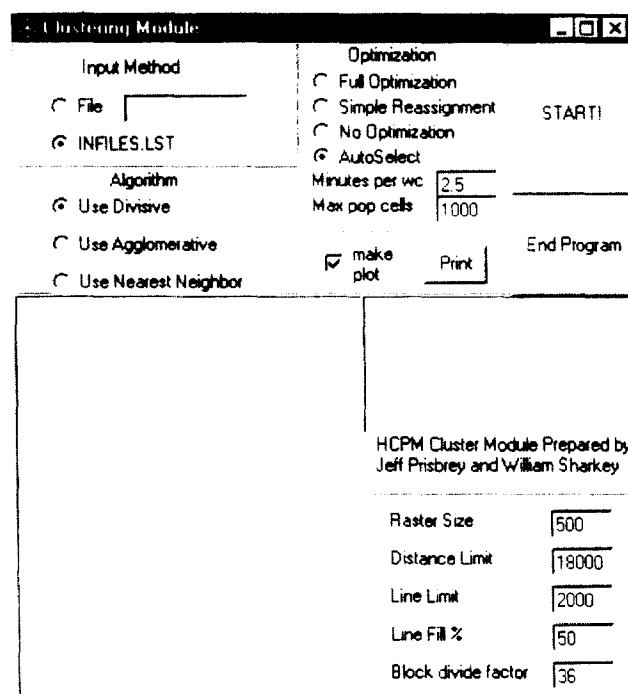


If you select the HCPM view the system will gray out the CBG Rollup module and rename the Loop to FeedDist as shown below.



The View selection will automatically display the states that were associated with that particular view. It will also gray out any modules that cannot be processed for that view type. In the example above the HCPM view is an HCPM type so the CBG Rollup module is grayed out. Select the states you would like to process by clicking on the appropriate check boxes.

The Cluster/ClusIntf option call the Cluster model up. At that time you are prompted to make parameter choices and then click on the **START** button.



The Loop, Transport, and Switching Modules produce network investments. The CBG Rollup module, which is only available on BCPM type of views, generates network investments by

Census Block Group (CBG) and wire center. The Capcost Module develops annual cost factors which are applied to investment in the Reports Module to determine depreciation, cost of money, and taxes. Select the modules you would like to process by selecting the associated check boxes.

Special Note

The CBG Rollup module must be processed after the Loop module. If you select both modules at the same time a "Missing File" warning will be generated.

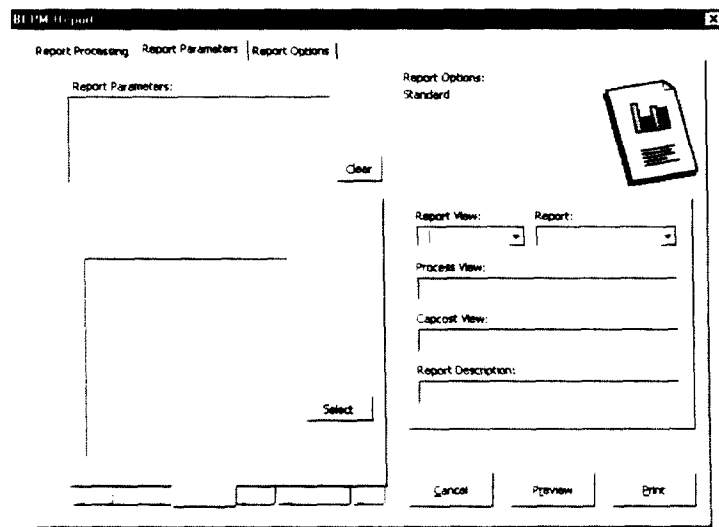
After you have selected the states and modules to process, click on the **OK** button. The amount of time processing takes is dependent on your hardware setup.

Reports

In the Reports Module, Signaling investments are added to the investments developed by the Loop, Switching and Transport Modules. To develop the associated monthly costs, the annual cost factors from the Capcost Module are applied and expenses are calculated.

By selecting the **REPORTS** button from the main dialog box, you can choose reports to process, set report parameters, and select report formats.

The Reports dialog box that is displayed includes three tabs as shown below:



Report Processing

The Report Processing tab is shown below for a BCPM view type.

The HCPM view type will produce the screen below

The different view types use different modules and subsidy units. The type on the view triggers the use of the different options.

Report processing ties together the investment costs and expenses to generate a total cost. To complete processing, select a View from the Process View list and a View from the Capcost list. By default, these two choices are the same. To combine the loop data from one view with the cost of capital from another view, simply select the appropriate items.

The system default for the Module Set is automatically chosen. It may be possible to select an alternate Module Set. Alternate module sets may exist to generate differing views of support.

It is also possible to select one or more Subsidy Unit options. The default option is Process By Grid. However, the subsidy calculations can be summarized by CBG or by Wire Center. It is

important to note that the subsidy is calculated by grid and then summarized to the higher levels, not calculated at the higher levels directly.

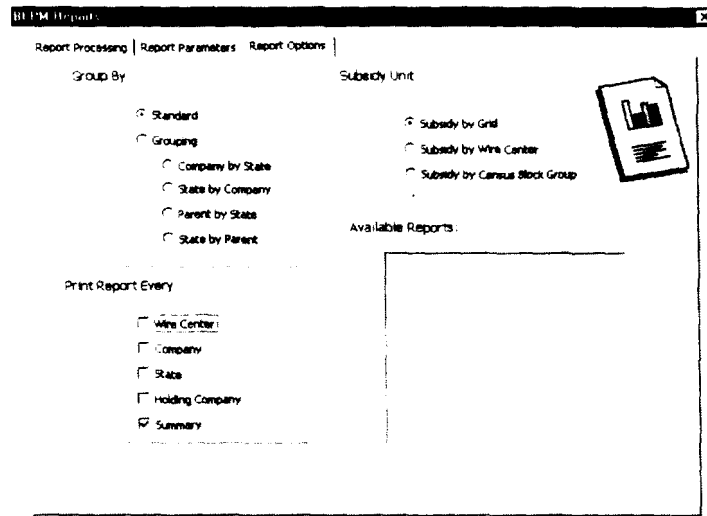
To do the actual data processing, select the **OK** button.

Special Note

You can not produce reports for a state unless the Loop module, Switching module and the Transport module have been processed for the selected View in the Process View list. However, it is only necessary to process the Capcost module for the item selected in the Capcost list.

Report Options

On the Report Options tab, you can select various reporting options. The Report Options tab is shown below:



The major reporting options include the ability to group data, control frequency of printing, set the source data for reports, and control which reports are printed in each report workbook. The tab above shows the default settings for each option.

Group By

The Group By option is used to control data summarization. These options are linked with the type of report chosen. The reports in the model are classed as either a detail report or a summary report. The type of report is generally evident based on its name. The Group By options control how the tabs work on the Report Parameters tab.

The Standard option is used with detail reports. By selecting the Standard option, you have the greatest reporting flexibility. All elements of the data hierarchy are available. These include parent company, company, state and wire center.

The Grouping option is used with summary reports. The actions of each option are similar. For instance, choosing the State by Company option would allow you to group by a state and then by company. This gives you the ability to generate summary reports at higher levels of aggregation.

Print Report Every

The choices here reflect the how reports will be printed. The hierarchy shown is from lowest level of detail to highest. A report will be printed for every level selected. For detail reports, you can choose every option. For summary reports, the choices are automatically generated to reflect the level of summarization.

Subsidy Unit

The Subsidy Unit option is used to select the data used to generate the reports. The default is Subsidy by Grid. The Subsidy by Wire Center option and the Subsidy by CBG option will only be meaningful if the report data was generated for each of these choices. See Report Processing above for more details.

It is important to note that the type of subsidy does not determine how the subsidy was calculated. The support is always calculated at the grid level and aggregated up the higher levels.

Available Reports

The Available Reports list contains a list of all reports associated with the report to be processed. You may select one or more items from the list. Each item selected will be printed if the requested. By default, the first item is always selected. This option has no impact on previewing a report.

Report Parameters

To actually generate a report, establish report parameters by completing the Report Parameters tab shown below:

The screenshot shows the 'BCPM Reports' window with the 'Report Parameters' tab selected. The window is divided into several sections:

- Report Parameters:** A large empty box with a 'Clear' button to its right.
- Select one or more Holding Companies:** A list box containing the following companies: COWICHE TEL CO, ELLENSBURG TEL CO, GTE CORPORATION, HAT ISLAND TEL CO, HAT ISLAND TELEPHONE, HOOD CANAL TEL CO, INLAND TELEPHONE CO, KALAMA TEL CO, MASHELL TELECOM INC, PACIFIC TELECOM INC, PEND OREILLE TELEPHONE COMPA, PIONEER TEL CO, SPRINT, and ST JOHN TEL CO. A 'Select' button is to the right of the list.
- Report Options:** A section with a floppy disk icon and the text: 'Standard by Grid Area Summary'.
- Report View:** A dropdown menu showing 'WaFiBase_WaF'.
- Report:** A dropdown menu showing 'Area Summary'.
- Process View:** A text box containing 'WaFiBase: Washington Forward Looking View'.
- Capcost View:** A text box containing 'WaFiBase: Washington Forward Looking View'.
- Report Description:** A text box containing 'Area Summary, Support Detail, Inventory, etc.'.
- Buttons:** 'Cancel', 'Preview', and 'Print' buttons at the bottom right.
- Footer:** A row of tabs: 'Holding Company', 'Company', 'State', and 'Wire Center'.

To generate a report you must select a Report View and Report. The Report View is generated in the Report Processing step detailed above. A partial list of possible reports is listed below:

- Detail – This will create a workbook with Area Summary, Uncapped Analysis, Capped Analysis, Uncapped Density Summary, Capped Density Summary, Uncapped ARMIS Format, Capped ARMIS Format, Household Summary, and Inventory reports.
- Summary – This will create a workbook with Loop Statistic, Investment Statistic, Residence Aggregate Support, Business Aggregate Support and Business Aggregate Support reports.
- WC Summary – This will create a wire center summary report with the same parameters as the summary setting
- Capped Summary, Capped WC Summary - These workbooks and their associated reports are the same as the like choices listed above. The only difference being that the reports are generated using capped investment data.

After you select the Report View and Report, set the report parameters by specifying the state, company, holding company, or the wire center you want results for by highlighting your choice and clicking **SELECT** or by clicking twice on the name of the company, state, etc. The tabs associated with the report parameters will change depending on what report and grouping options that were selected. For instance if grouping by State by Company is selected only the State and Company tabs will be enabled.

Click **PREVIEW** to view the model results in a worksheet format. A worksheet will appear and a BCPM toolbar which will enable you to Print, Save As and Close. If you to save a workbook with results, the chose the Save As control from the BCPM Report toolbar.

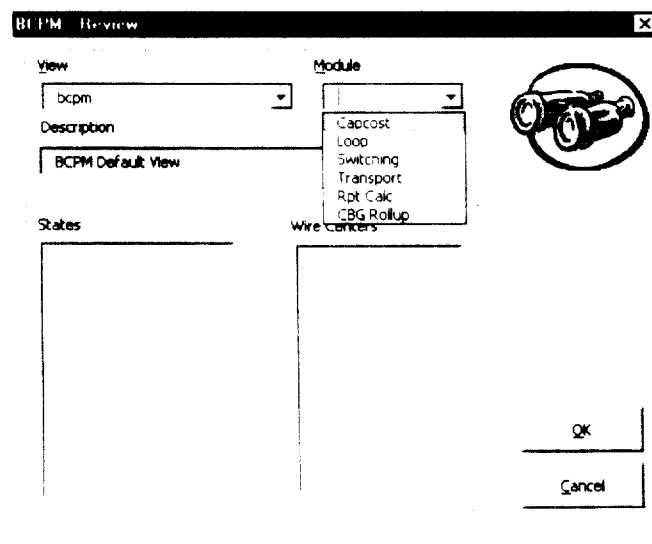
Click **PRINT** to print the selected reports. The items that will be printed are controlled by the Print Report Every option and the items selected in the Available Reports list.

Click **CANCEL** to return to the BCPM Control screen

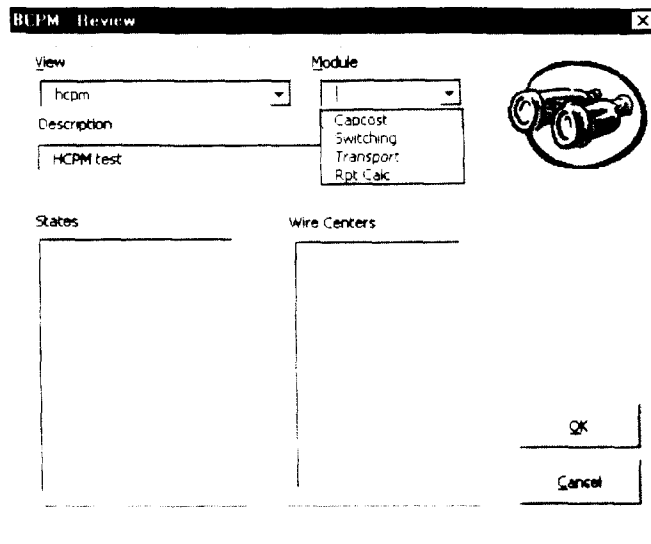
Review

The review portion of the system is for auditing the module calculations in BCPM. Access this subsystem by click on the **REVIEW** button.

When you select a BCPM view the drop down box will only display the Modules associated with the BCPM view type. **Capcost, Loop, Switching, Transport, Rpt Calc and CBG Rollup.**



When you select an HCPM view the drop down box will only display the Modules associated with the HCPM view type. **Capcost, Switching, Transport, and Rpt Calc.**



BCPM Review

View: hcpm
Description: HCPM test

Module: Capcost, Switching, Transport, Rpt Calc

States: [Empty Box]
Wire Centers: [Empty Box]

OK
Cancel

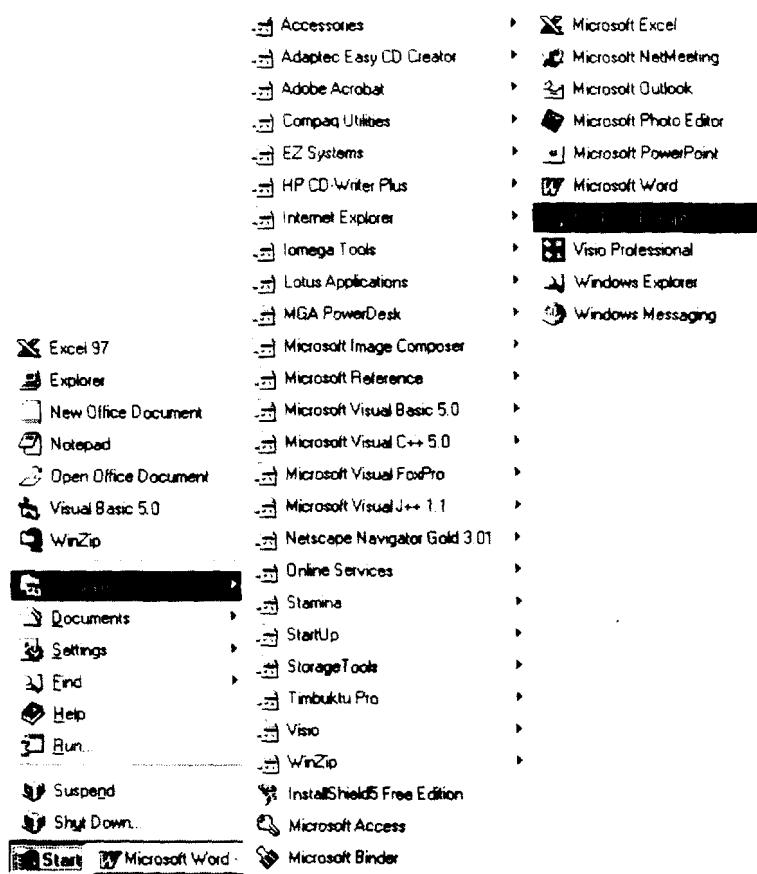
When you see the review screen you must select a View. Then you can select the module you would like to review. The system will work for several seconds while it pulls module data. You can then select the state and the wire center for review. Click on the **OK** button and the system will present you with the workbook that contains the calculations for your selection. You can then evaluate the calculations used for your View.

Technical Support

If you have any questions call the INDETEC Support line at 800-746-4356

Attachment A: Utilizing DOS Attrib command

To invoke a DOS session from Windows, select the MS-DOS Prompt from the Start/Programs menu.



Once in a DOS session type the commands as follows:

```
C:\WINDOWS>cd \bcpm31 (directory where model was installed/copied)
```

```
C:\wabcpm31>attrib -r /s
```

```
C:\wabcpm31>exit
```

The exact directories shown above will depend on the configuration of your PC.

HCPM CLUSINTF Program

The BCPM sponsors have performed an initial analysis of the HCPM Clustering module that includes a conversion of the Pascal source code into pseudo code, for ease of further analysis. As well as review of the pseudo code by Stopwatch Maps. It should be mentioned that this analysis was completed in a very short amount of time. Further review will be necessary to confirm these initial impressions as well as any interaction with the VB clustering code. The HCPM CLUSINTF pseudo code has also been included for reference and further review by the reader.

A Brief Review of the HCPM CLUSINTF Program

To place this program in perspective, it is the code that performs the Grid Overlay of each cluster, as defined in section 3.2 of the HCPM documentation. Its principal input is the set of points of each cluster of each wire center.

The points (customer locations) were earlier determined -- were each assigned x and y coordinates -- by geocoding or by surrogate assignment methods. The *clustering* of those points (the grouping of customer points to form clusters which will become distribution areas) was then performed by the program previous to this program in the process. The output of this CLUSINTF program becomes input to the FEEDDIST program, which performs loop design.

The CLUSINTF program is straightforward. Its purpose seems to be the reduction of the number of discrete entities that a loop design program must deal with ... a "thinning" that is more important to a model's performance for very populous wire centers than for sparse ones. It accomplishes its purpose by overlaying each cluster with very small square grids ("microgrids"), then aggregating in each of these grids the counts and other attributes of the customer locations that fall within it. Having done this for a cluster -- and having calculated the line density for that cluster -- it outputs the relevant data for each cluster to a file. The action is repeated until all clusters to be treated have been processed.

For each cluster, the program:

- Collects all points of the cluster
- Determines the minimum bounding rectangle (MBR) of this set of points
- Choosing the greater of height or width of the MBR, "marks off" vertical or horizontal increments along that dimension of the MBR, each the length of the specified *raster size* unit ... If the number of gradations exceeds 50, increases for this cluster the raster size to use exactly 50 ... Then, in any case, "marks off" in the lesser dimension increments of the same size, forming a set of square microgrids that cover the entire MBR
- Determines and collects, for each microgrid of the cluster, the customer count and attribute data for locations that fall in that microgrid ... In later steps, those customers will be assumed to be located uniformly throughout a microgrid (but not necessarily uniformly throughout a cluster)

- Establishes points at the upper left, upper right, lower left, and lower right corner of each microgrid *that has customer location content* ... then uses those points to form a convex hull of the cluster, and determines the area of that convex hull, using classic algorithms
- Retaining only those microgrids that have customer location content, writes data for each to a file that will be input to the FEEDDIST program
- Determines the line density of the cluster, and writes that to another file that will be input to the FEEDDIST program

The division of the retained grids into customer lots, and the design of distribution to those customers, is not part of this program, but of the FEEDDIST program that follows.

Summary

We see little to quarrel with regarding this program. The clustering method, and the distribution design method and constraints, present much more interesting areas for analysis and critique ... but those functions occur before and after this program, respectively.

We can empathize with the compromise between ultimate granularity and reasonable processing time that is behind the “rasterization” of customer locations into small grids. We find it reasonable to accept that, given these very small grids, the arbitrary uniform spread of customers independently within each grid should not damage the modeling of distribution.

Certainly, we have seen no reason to reject the process performed by the CLUSINTF program nor the logic by which that process is performed.

HCPM – CLUSINTF module - version 2.6 Pseudo code

Preface

This document was created by taking the HCPM Pascal source code and converting it into pseudo code. The pseudo code was designed so that the details of the calculations performed in the code were retained, while the other aspects of the source code such as file handling and memory management were summarized or removed.

Disclaimer

While every effort was made to generate pseudo code that accurately reflects the logic in the Pascal code, it is recommended to refer to the Pascal code if there are any questions.

Browsing the Document

Each procedure and function call is set up as a hot link to the associated code. Use the back button on Word's "Web" toolbar to return to the previous position in the code.

Formatting

Styles were used in formatting the text. The styles can be edited so that the text will stand out in a printed version of this document.

Procedure and function names are formatted with the style **ProcOrFunction**.

Global variable names are formatted with the style **Global Variable**.

Warnings are formatted with the style **WarningMsg**.

Comments are formatted with the style *Comment*.

The original comments from the source code are in curly brackets {}

For explanatory text that replaces code, the text will appear as normal text.

Procedure Argument Syntax

Variables that are passed to a procedure (including functions) can also return values set by the called procedure. Such variables are preceded with a *. both in the procedure definition, and in the actual call to the procedure.

[Go to the start of the program](#)